Citation:

Yang Z, Bishai D, Harman J. Convergence of body mass with aging: the longitudinal interrelationship of health, weight, and survival. *Econ Hum Biol*. 2008 Dec;6(3):469-81.

PubMed ID: 18676210

Study Design:

Longitudinal Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

The authors constructed a system of simultaneous equations (structural equation models) to quantify the relationship between annual changes in BMI, experience of chronic conditions, changes in functional status, and mortality.

Inclusion Criteria:

The analysis used data from the Cost and Use files of the Medicare Current Beneficiary Survey (MCBS) and include at least 2 years of observational data for the individual, between the years of 1992 to 2001.

Exclusion Criteria:

Respondents with only 1 year of observation data were excluded.

Description of Study Protocol:

Recruitment Data were from the Cost and Use files of MCBS.

Design Longitudinal study. MCBS is a longitudinal survey conducted by the Center for Medicare and Medicaid Services to examine care use, and health status of a representative sample of Medicare beneficiaries in the US.

Blinding used (if applicable) not applicable

Intervention (if applicable) not applicable

Statistical Analysis The empirical analysis was conducted at a person-year level. They constructed a dynamic simultaneous equation system as a proxy of the aging process to quantify the relationship between the changes in body weight and changes in health status.

© 2012 USDA Evidence Analysis Library. Printed on: 09/24/12

The simultaneous equation system is characterized by several equations:

- health transition to predict the probability of death or incidence of functional disability conditional on age and body weight
- medical event equations to predict incidence of conditions
- BMI equation to estimate the change of BMI from year to year

The researchers performed 2000 replications of the simulation for each individual using parameters obtained from the analytical model starting at age 65 through age 100 (unless the person was simulated dead).

Data Collection Summary:

Timing of Measurements The MCBS surveys used in this project were conducted annually between the years of 1992 and 2001.

Dependent Variables

- Health condition by the end of the year.

Independent Variables

- BMI

Control Variables

- Major medical events during the year (heart, respiratory, cancer)
- Health care utilization and expenses
- Smoking status
- Demographics such as age and gender

Description of Actual Data Sample:

Initial N: 28,966 individuals, resulting in an analytical sample of 85,038 person-year observations.

Attrition (final N): 28,966

Age: 65 years and older

Ethnicity: 9% black, 5% other

Other relevant demographics: 41% male; 40% widowed, 10% divorced

Anthropometrics

Location: United States

Summary of Results:

Key Findings

© 2012 USDA Evidence Analysis Library. Printed on: 09/24/12

- Among the survivors at age 65, 60% were overweight or obese, 40% normal weight, and few were underweight.
- Among the survivors at age 100, 60% were normal weight, 20% underweight and only 20% were overweight or obese.
- The relationship between concurrent BMI and worse health outcomes is nonlinear; either high or low BMI is associated with worse health outcomes, with BMI between 20-25 associated with the best health outcomes. BMI has significant influence on the probability of the incidence of major medical events.
- Having heart or respiratory disease is associated with lower body weight, while diabetes is associated with higher body weight. The unexpected relationship of lower body weight and heart disease may be due to people reducing weight after a diagnosis of heart disease.
- Participants reporting functional disabilities or major medical events are more likely to die or be disabled.
- Males in normal weight range at 65 have a life expectancy of 81.91 years, while overweight males life expectancy is 81.15. Normal weight males have the longest average healthy life expectancy (without functional disability) of 75.44 years.
- Normal weight women have a longer life expectancy, 85.24 years, and healthy life expectancy 73.52, than overweight women at 83.82 and 71.86 years respectively.

Author Conclusion:

The results of this study suggest that optimal BMI at age 65 appears to be within the normal weight range of 18.5 to 25. Individuals with normal weight at 65 not only survive the longest, but also have the longest healthy life expectancy (gain of about 1.4 years in comparison with obese).

Reviewer Comments:

Large representative sample.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

© 2012 USDA Evidence Analysis Library. Printed on: 09/24/12

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes

© 2012 USDA Evidence Analysis Library. Printed on: 09/24/12

4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes

© 2012 USDA Evidence Analysis Library. Printed on: 09/24/12

7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes

© 2012 USDA Evidence Analysis Library. Printed on: 09/24/12

Copyright American Dietetic Association (ADA).

© 2012 USDA Evidence Analysis Library. Printed on: 09/24/12